A303 Amesbury to Berwick Down

TR010025

6.3 Environmental Statement Appendices

Appendix 8.9C Aquatic macro-invertebrate survey Amesbury springs

Volume 6

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

October 2018

Project:	**A303 Amesbury to Berwick Down**				
Title:	**Aquatic macro-invertebrate survey Amesbury springs**				
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Revision	Date	Prepared by	Reviewed by	Approved by
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1. Introduction

1.1. Background

In light of the proposed route of the A303 from Amesbury to Berwick Down ('proposed scheme' hereafter), AECOM were commissioned to undertake a baseline study to inform an EIA. A desk study was completed during a scoping report which identified potential ecological receptors of the proposed scheme. This included statutory and non-statutory designated sites. For aquatic receptors, the zone of influence from the proposed scheme has been defined as 2 km downstream. As such the Hampshire River Avon SAC and SSSI were identified; this is crossed twice by the proposed scheme of which one crossing is at the existing bridge east of Amesbury.

As part of the EIA scoping report[1] it was identified that there was a need to collect aquatic invertebrate (macroinvertebrate hereafter) data to inform baseline conditions. Macroinvertebrate surveys were therefore conducted at the River Avon and surrounding springs near the Amesbury crossing. Macroinvertebrate surveys for the River Avon have already been conducted[2], but there was a need to complete surveys on two springs that feed into the River Avon within the 2 km zone of influence. These were the Blickmead Spring and the West Amesbury Spring. This technical note reports on the data collected from the macroinvertebrate surveys at these two springs and the aquatic habitat assessment that was conducted at the time of these surveys.

1.2. Survey area

Both the Blickmead Spring (SU 14787 41846) and the West Amesbury Spring (SU 14312 41443) fall within the catchment of the River Avon SAC/SSSI and flow directly into the river (See Figure 1 for spring locations).

The primary Annex I habitats designating the River Avon SAC/SSSI are it is a watercourse of plain to montane levels that includes sections that run through chalk and clay. There are five aquatic *Ranunculus* spp. that can be found in the river system which are dominated by stream water-crowfoot *Ranunculus penicillatus* ssp. *Pseudofluitans* and river water-crowfoot

[1] AmW (2017) A303 Stonehenge – Amesbury to Berwick Down EIA Scoping Report. Prepared for Highways England
[2] ArupAtkins (2017) River Avon Aquatic Macroinvertebrate Surveys Technical Note. Prepared for Highways England

R. fluitans. R. pelatus is also included in the designation as the dominant water-crowfoot species in the winterbourne reaches. Annex II species that are the primary reason for its designation are Desmoulin's whorl snail *Vertigo moulinsiana*, sea lamprey *Petromyzon marinus,* brook lamprey *Lampetra planeri,* Atlantic salmon *Salmo salar* and bullhead *Cottus gobio.*

Blickmead Spring is situated in the grounds of Amesbury Abbey which is primarily broadleaf wood and improved grassland for parkland and lies to the south of the proposed scheme. West Amesbury Spring is situated further south than Blickmead and is surrounded by broadleaf woodland, pastoral grazing fields and suburban land. Both springs permeate through chalk bedrock.

1.3. Objectives

The objectives of the macroinvertebrate survey and aquatic habitat assessment were to:

- Provide an assessment of the biological quality and conservational value of macroinvertebrate assemblages at the two springs;
- Assess the suitability of the habitat to support any notable fish populations and macrophyte communities and;
- Identify any further aquatic surveys to inform the baseline study.

2. Methodology

2.1. Macroinvertebrates

At both springs a macroinvertebrate sample was taken on the 15th November 2017 by an experienced aquatic ecologist using a standard Freshwater Biological Association (FBA) pattern pond net (mesh size: 1 mm) applying the 'kick sampling' method[3]. This methodology is the standard procedure used by the Environment Agency, the Scottish Environment Protection Agency and the Northern Ireland Environment Agency and so is considered best practice. Samples should be taken in spring and autumn to provide the most comprehensive representation of macroinvertebrate diversity[4].

The sample was collected in a single area that was most representative of the waterbody. The major habitat types within the sampled area were proportionally covered within 3 minutes. Where there was flow, the surveyor moved upstream whilst sampling. The substrate and marginal vegetation was agitated by 'kicking' the substrate upstream of a pond net to catch any macroinvertebrates dislodged.

Samples were then preserved in isopropyl alcohol 70% v/v for laboratory processing by an experienced AECOM macroinvertebrate taxonomist with identification to 'mixed taxon level', which is to species level (where practicable) for the majority of groups.

Samples taken were analysed using the indices set out below (details of the indices can be

[3] EU-STAR (2004) UK invertebrate sampling and analysis procedure for STAR project [online]. Available at: http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf (accessed on 20/12/2017)
[4] Hill, M.J., Sayer, C.D. and Wood, P.J. (2016) 'When is the best time to sample aquatic macroinvertebrates in ponds for biodiversity assessment?' Environmental Monitoring Assessment, 188, 194

found in Appendix A);

- Biological Monitoring Working Party (BMWP) scores and Average Score Per Taxon (ASPT) values - scores are derived based on the sensitivity of particular taxa (families) of invertebrates to organic pollution;
- Community Conservation Index (CCI) method – to assess the conversation value of the macroinvertebrate populations present and identify any unusual or rare species;
- Lotic-Invertebrate Index for Flow Evaluation (LIFE) method – to assess the sensitivity of benthic macroinvertebrate communities to variable flows. Higher flows should result in higher LIFE scores; and
- Proportion of Sediment-sensitive Invertebrates (PSI) index – to assess the sensitivity of benthic macroinvertebrate communities to fine sediments.

2.2. Aquatic habitat assessment

At both springs a walkover assessment was made of the physical habitat present and its suitability to support notable aquatic species. Additionally, external pressures, impacts and modifications could be assessed. This gave scope as to the need of any further more detailed surveys (such as a summer macrophyte survey, spring macroinvertebrate survey and fish population survey). The following habitat characteristics listed below were recorded at both springs:

- macrophyte presence, cover and species;
- waterbody bed substrate;
- depth and width of waterbody;
- habitat type (e.g. riffle, cascade, glide, pool, ponded reach etc.);
- fish presence and salmonid spawning features (defined as depth >15 cm; velocity 0.3-1.0 m/s; substrate 10-150 mm and >1.5 m^2 (anadromous salmon); substrate 10-75 mm and >0.1 m^2 (resident trout)).
- modifications and pressures to the waterbody and;
- characteristic surrounding land use.

3. Results

3.1. Aquatic habitat assessment

3.1.1. Blickmead Spring

Blickmead Spring formed a waterbody that was connected to the River Avon towards the southern bank. This waterbody was on average 10.5 m in diameter and had an average depth of approximately 30 cm. The depth did vary across the waterbody, with a maximum depth of approximately 100 cm in places where sink holes had formed.

The land was primarily characterised by thick broadleaf woodland on the northern bank, which gave moderate shading to the majority (80%) of the waterbody (Plate 1). The remainder of the surrounding land was characterised by improved grassland and parkland. As such, the majority of the banks comprised of uniform (1 dominant) vegetation type.

The habitat type of the spring waterbody was 100% ponded reach and was considered under normal conditions, with no additional flood water from the River Avon. The substrate consisted of thick silt with additional fallen broadleaf matter. The bed stability was therefore soft. The water turbidity was clear. Due to the substrate conditions there was no suitable salmonid spawning habitat present.

Plate 1: Blickmead Spring with moderate shading from broadleaf wood and areas of starwort (*Callitriche* spp.).

There was limited macrophyte diversity with three species recorded as follows in order of dominance; starwort *Callitriche* spp. (Plate 1), yellow flag iris *Iris pseudacorus* and pendulous sedge *Carex pendula*. These covered an area of approximately 20% of the waterbody.

3.1.2. West Amesbury Spring

The West Amesbury Spring flowed in to the River Avon at approximately 65 m to the south of the source of the spring. The waterbody formed by the spring at the top section was on average 0.25 m wide and as little as 3 cm deep (referred to as section 1 hereafter). This section flowed for approximately 10 m before entering an area with an average width of 4 m and an average depth of 5 cm (referred to as section 2 hereafter).

The surrounding land of the spring was primarily characterised by semi-improved grassland and secondly by broadleaf wood. This was cattle grazing land which was evident by the heavy poaching across the whole waterbody formed by the spring (Plate 2). There was heavy shading over the majority of the spring waterbody from the surrounding broadleaf trees. Although there were no clearly defined banks, the immediate vegetation around the spring was uniform.

Plate 2: Heavy cattle poaching at West Amesbury Spring.

The habitat type of the spring waterbody comprised of a riffle (over section 1) and a ponded reach (over section 2). The flow in section 1 was considered to be normal conditions at <10 cm/sec. The dominant substrate in section 1 was gravel and in section 2 it was silt. This resulted in the bed stability being loose at section 1 and soft at section 2. The water turbidity was clear. The resultant waterbody from the spring did not support any salmonid spawning habitat or fish habitat.

Macrophyte diversity was minimal, with just three species recorded covering an area of 30%. Fools watercress *Apium nodiflorum* and watercress *Nasturtium officinale* were found at section 2 (Plate 3) and an area of great manna grass *Glyceria maxima* was identified along the right side of section 1.

Plate 3: Watercress (*Nasturtium officinale*) and fools watercress (*Apium nodiflorum*) were present at West Amesbury Spring.

3.2. Macroinvertebrates

The macroinvertebrate species list and results of the indices can be found in Appendix B.

3.2.1. Blickmead Spring

The macroinvertebrate diversity at this spring was moderate with 12 species identified from the sample. All of species found had a conservation value of Local or below (see Appendix A, Table A2) (e.g. the caddisfly *Beraeodes minutus*). This was reflected in the CCI score (8) (see Appendix A, Table A3), which was of Moderate conservation value.

The PSI score (species) of 13.6 indicates that the waterbody at this spring was Heavily sedimented (see Appendix A, Table A5). The LIFE score (species) was 6.4 with the majority of the scoring species being made up of those falling in to the Flowing/standing and Slow/sluggish flow groups (see Appendix A, Table A4) (e.g. the freshwater snail *Radix balthica* and the crustacean *Crangonyx pseudogracilis*).

The biological quality of the waterbody at this spring was Good (BMWP score 75, ASPT score 4.7).

3.2.2. West Amesbury Spring

The species diversity at this spring was low with four species identified from the sample. The majority of the species had a conservation value of Frequent or Very common, with the exception of the caddisfly (*Silo nigricornis*) which had a conservation score of Local. This caddisfly was represented in the CCI score of 12.5 which is of Fairly high conservation value.

The PSI score (species) of 46.7 indicates that the waterbody at this spring was Moderately sedimented. LIFE score (species) was 8.5. The majority of the species were made up of those that were in the Moderate/fast and Flowing/standing flow groups (e.g. the crustacean *Gammarus pulex*), with the exception of the caddisfly (*Silo nigricornis*) that falls in to the Rapid flow group.

The biological quality of this spring was Moderate (BMWP score 47, ASPT score 4.7).

4. Discussion and Recommendations

4.1. Blickmead Spring

The heavy sedimentation observed during the aquatic habitat assessment was represented in the PSI score. This is of no surprise, with the habitat type being mainly ponded conditions (as represented in the LIFE species score). The species assemblage was typically that of what would be expected in such a low flow environment. Leeches, flatworms, mussels, limpets and Chironomidae are expected in such an environment where flow is the main environmental factor that influences species assemblage[5].

The lack of macrophyte diversity and particularly submerged plants is of no surprise in this shaded and sedimented waterbody and the species composition is expected in such a low flowing waterbody.

It is unlikely that salmonid fish species would use this waterbody due to the low flow and sediment substrate.

With the points discussed no additional fish or macrophyte surveys would necessary to informing the baseline study. However, it is recommended that a spring macroinvertebrate sample is collected to assess the seasonal diversity at this spring[6].

4.2. West Amesbury Spring

The lack of macroinvertebrate diversity observed at this spring was expected with the heavy poaching, and very shallow depths. The species composition was representative of the habitat type (mainly riffle) in section 1 where species were mainly associated with Moderate/Fast flow types.

The CCI score was elevated by the caddisfly of Local value and one would expect that, with the observed pressures and habitat quality, is not a representative CCI score for the spring.

The lack of macrophyte diversity coincides with the shallow depth, heavy poaching and sedimentation. Additionally, for similar reasons, fish would not use the waterbody created by the spring.

In line with the points discussed, no further surveys are required for fish and macrophytes. However, it is recommended that spring macroinvertebrate sample is collected to assess

[5] Williams, P., Whitfield, M., Biggs, J., Bray, S., Fox, G., Nicolet, P. and Sear, D. (2004) 'Comparative biodiversity of rivers, streams, ditches and ponds in an agricultural landscape in Southern England', *Biological Conservation,* 115, 2, 329-341

[6] Hill, M.J., Sayer, C.D. and Wood, P.J. (2016) 'When is the best time to sample aquatic macroinvertebrates in ponds for biodiversity assessment?' Environmental Monitoring Assessment, 188, 194

seasonal diversity[7]

Appendix A	Details of macroinvertebrate indices

Biological Monitoring Working Party Score (BMWP Score), Average Score Per Taxon (ASPT)

Based on each family's sensitivity to organic pollution, aquatic ecologists have allocated scores between 1 and 10 to about 80 taxa (known as the BMWP-scoring families) of benthic macroinvertebrates colonising flowing freshwater habitats. The BMWP Score for a site comprises the sum of the scores for individual taxa occurring at the site. The average of the values for each taxon in a sample, known as ASPT (average score per taxon), is a stable and reliable index of organic pollution and indicates the average sensitivity of the animals in a sample. Values lower than expected suggest environmental stress deriving from organic pollution.

The most useful way of summarising the biological data was found to be one that combined the number of taxa and the ASPT. Good quality is indicated by a diverse range of taxa, including those that are sensitive to pollution. Poorer quality is indicated by lower diversity and the absence of taxa that are sensitive to pollution. Organic pollution often results in an increased abundance of taxa adapted to tolerate it.

The biotic scores can be interpreted by following the guidelines in the table (Table A1) below[8][9][10]. However, these categories are for guidance only and it should be remembered that maximum achievable values will vary between geological regions. For example, pristine lowland streams in East Anglia will always score lower than pristine Welsh mountain streams as they are unable to support many of the high-scoring taxa associated with fast flowing habitat. BMWP scores and ASPT for different types watercourse are dependent on the quality and diversity of habitat, natural water chemistry (associated with geology, distance from source etc.), altitude, gradient, time of year the sample was taken and other factors.

Table A1: A guide to interpreting BMWP Score and ASPT

BMWP score	ASPT	Interpretation
0-10	<3.0	Very poor, heavily polluted
11-40	3.0-4.3	Poor, polluted or impacted
41-70	4.3-4.8	Moderate, moderately impacted

7 Hill, M.J., Sayer, C.D. and Wood, P.J. (2016) 'When is the best time to sample aquatic macroinvertebrates in ponds for biodiversity assessment?' Environmental Monitoring Assessment, 188, 194

8 Armitage, P.D., Moss, D., Wright, J.F. and Furse, M.T. (1983) 'The performance of a New Biological Water Quality Score System based on Macroinvertebrates over a wide range of unpolluted running-water sites', Water Research 17, 3, 333 – 347

9 Chapman, D. (1996) Water Quality assessments: a guide to the use of biota, sediments and water in environmental monitoring. 2nd Edition. UNESCO, London.

10 Mason, C.F. (2002) Biology of Freshwater Pollution, Fourth Edition. Prentice Hall, London.

71-100	4.8-5.4	Good, clean but slightly impacted
>100	>5.4	Very good, unpolluted, unimpacted

Community Conservation Index (CCI)

Predictive methodologies are able to suggest suites of species suited to a site, based on location and key physico-chemical features as many organisms require not only good quality water, but also appropriate habitat. The evaluation of conservation value or potential should therefore incorporate habitat assessment. It should also be remembered that although family-level identification may be adequate for water quality assessment, it is not sufficient for conservation evaluations, for which, individual components must be identified to species level.

Analysis of species-level data to estimate conservation value can be achieved by way of the Community Conservation Index (CCI)[11] which allocates a score of 1–10 (common species score 1; Endangered (RDB1) species score 10) to aquatic macroinvertebrates colonising British freshwater and brackish ecosystems (Table A2). The scores are summed, and then divided by the number of scoring species to derive an average. This is then enhanced using a multiplier (Community Score or CoS) based on BMWP score, which is strongly influenced by habitat as well as water quality, and acts as a surrogate for measures of species richness or community diversity. The CoS may also be based on the rarest taxon in the dataset. Whichever CoS is the higher is the one which is used in multiplication. Thus, samples supporting a large number of common species or a sample supporting a limited fauna, but including rare species, are accentuated.

Table A2: Conservation Scores from the Community Conservation Index

Conservation Score	Conservation value/Equivalent RDB status
10	RDB1 (Endangered)
9	RDB2 (Vulnerable)
8	RDB3 (Rare)
7	Notable (but not RDB status)
6	Regionally notable
5	Local
4	Occasional (species not in categories 10-5, which occur in up to 10% of all samples from similar habitats)
3	Frequent (species not in categories 10-5, which occur in up to >10-25% of all samples from similar habitats)

[11] Chadd, R. & Extence, C. (2004) 'The conservation of freshwater macroinvertebrate populations: a community based classification scheme. Aquatic Conservation', Marine and Freshwater Ecosystems 14, 597-624.

2	Common (species not in categories 10-5, which occur in up to >25-50% of all samples from similar habitats)
1	Very common (species not in categories 10-5, which occur in up to >50-100 % of all samples from similar habitats)

The overall index provides an indication of the conservation value of the community sampled based on a combination of the rarity of the different species present and overall community richness, as shown on Table A3. In some cases, expert judgment may be needed to moderate these assessments with reference to current information on status and distribution.

Table A3: Guidance on interpretation of CCI scores[12]

CCI Score	Description	Interpretation
0.0 – 5.0	Sites supporting only common species and/or a community of low taxon richness	Low conservation value
5.0 – 10.0	Sites supporting at least one species of restricted distribution and/or a community of moderate taxon richness	Moderate conservation value
10.0 – 15.0	Sites supporting at least one uncommon species, or several species of restricted distribution and/or a community of high taxon richness	Fairly high conservation value
15.0 – 20.0	Sites supporting several uncommon species, at least one of which may be nationally rare and/or a community of high taxon richness	High conservation value
>20.0	Sites supporting several rarities, including species of national importance, or at least one extreme rarity and/or a community of high taxon richness	Very high conservation value

Lotic-invertebrate Index for Flow Evaluation (LIFE)

The Lotic-invertebrate Index for Flow Evaluation[13] is based on the recognised flow associations of different macroinvertebrate species and families. Taxa are assigned flow

[12] Chadd, R. & Extence, C. (2004) 'The conservation of freshwater macroinvertebrate populations: a community based classification scheme. Aquatic Conservation', Marine and Freshwater Ecosystems 14, 597-624.

scores (fs) which are calculated from a matrix (Table A4) based on the affiliation of the species/family for a certain flow regime and the estimated abundance of that species in a sample.

Table A4: Scores (fs) for different abundance categories of taxa associated with flow groups I-VI.

Flow Groups	**Abundance Categories**			
	A	**B**	**C**	**D/E**
I: Rapid	9	10	11	12
II: Moderate/Fast	8	9	10	11
III: Slow/Sluggish	7	7	7	7
IV: Flowing/Standing	6	5	4	3
V: Standing	5	4	3	2
VI: Drought Resistant	4	3	2	1

Standard Environment Agency macroinvertebrate abundance categories are shown in the table below (Table A5).

Table A5: River bed conditions for Proportion of Sediment Sensitive Invertebrates (PSI) scores.

PSI	**River Bed Condition**
81-100	Minimally sedimented/Unsedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

The greater the association a species has for a faster flow, the higher the flow score for that species. The LIFE score is calculated by totalling the flow scores for all taxa in a sample and dividing the result by the number of taxa used to calculate it. The greater the number of species associated with fast flows in a sample, the greater will be the LIFE score for that sample.

LIFE scores can be used to indicate possible impacts from low flows on macroinvertebrate communities in a watercourse. Abnormally low scores for sites expected to have an assemblage associated with fast flows would indicate an impact from over-abstraction of

[13] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999) 'River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives', Regulated Rivers: Research & Management, 15, 543-574

water or from impoundments. Changes in scores over time at a reference site can provide an indication of a changing flow regime within a watercourse. It must be noted that sites on sluggish, lowland rivers will naturally have low LIFE scores and this should not be interpreted as being any sign of an impact.

Proportion of Sediment Sensitive Invertebrates (PSI)

Impacts of fine sediment deposition on benthic macroinvertebrate communities have long been recognised. Alterations in benthic community structure are an inevitable consequence of fine sediment deposition. Such alterations are a direct result of smothering of substratum and clogging of interstices and indirectly through changes in macrophyte and algal communities.

Sources of fine sediment inputs to watercourses included agricultural land, urban environments, deforestation, road construction activities and mineral extraction. Other sources are from bank erosion, habitat modification or from low flows.

The PSI index has been used to assess the impacts of fine sediment loading on the aquatic macroinvertebrate communities on rivers and streams[14]. The index can be calculated for both family and species level data.

Taxa are individually assigned one four Sediment Sensitivity Ratings (SSR) defined in Table A6. This was achieved through an extensive literature review and an assessment of anatomical, physiological and behavioural traits exhibited by individual taxa.

Table A6: Fine Sediment Sensitive Ratings (FSSR) for groups of taxa.

Group	Fine Sediment Sensitivity Ratings (FSSR)	Log Abundance			
		1-9	10-99	100-999	1000+
A	Highly Sensitive	2	3	4	5
B	Moderately Sensitive	1	2	3	4
C	Moderately Insensitive	1	2	3	4
D	Highly Insensitive	2	3	4	5

The PSI score describes the percentage of sediment sensitive taxa present in a sample and the scores can be interpreted as shown in Table A7.

Table A6: River bed conditions for Proportion of Sediment Sensitive Invertebrates (PSI) scores.

[14] Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J. and Taylor, E.D. (2013) 'The assessment of fine sediment accumulation in rivers using macroinvertebrate community response', River Research and Applications, 29, 17-55

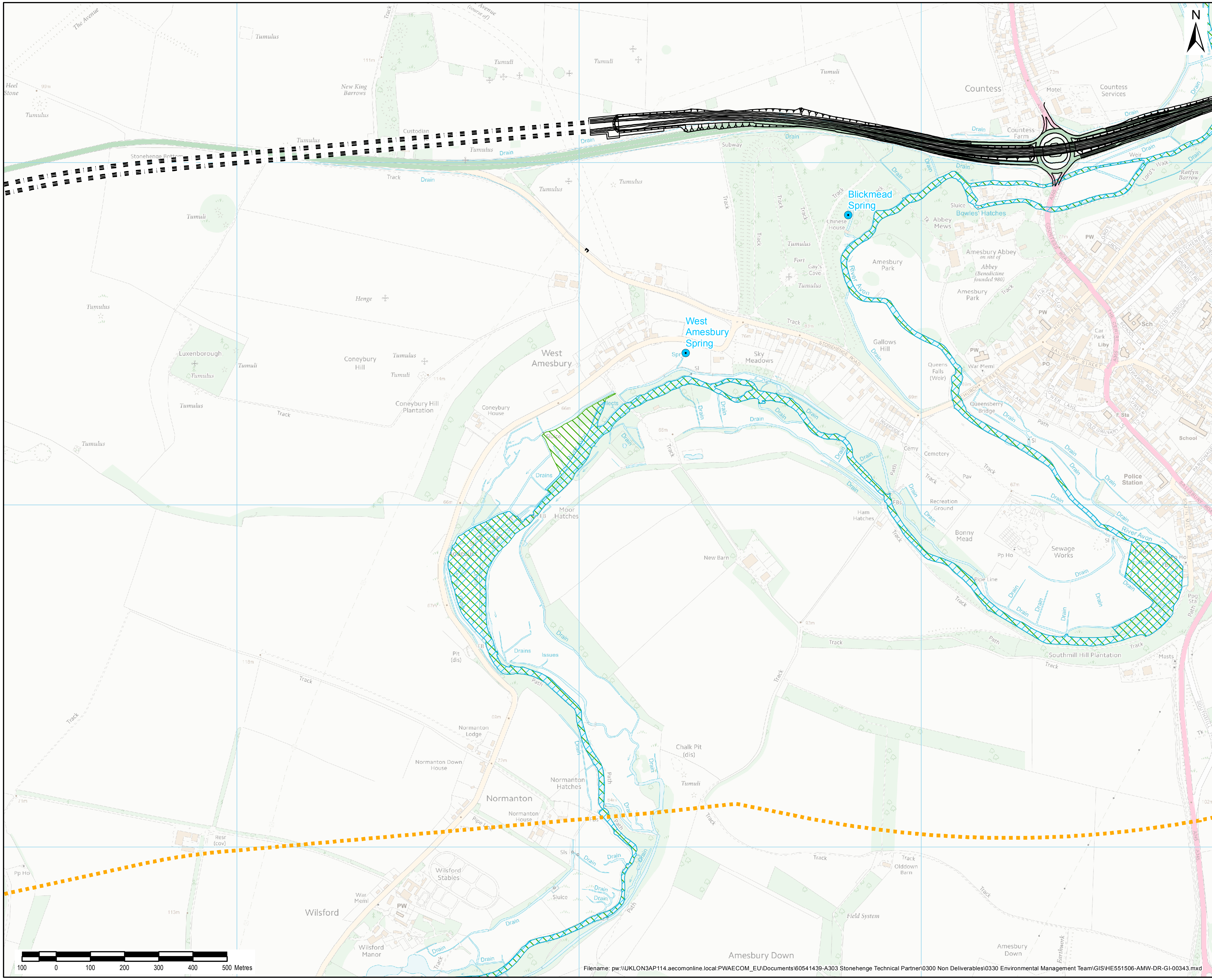
PSI	River Bed Condition
81-100	Minimally sedimented/Unsedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

The PSI score will show natural variation according to the nature of the watercourse being assessed. Additionally, unusually low PSI scores on a fast-flowing stony river would indicate excessive siltation. The PSI index is most valuable when used as a monitoring tool for tracking changes over time or for comparing baseline data with that collected post construction works.

Appendix A Macroinverterbrate species list and indices values

BMWP group	Species	BMWP score	Conservation Score	Flow group	FSSR Score	Blickmead Spring	West Amesbury Spring
Flatworms							
Dendrocoelidae	*Dendrocoelum lacteum*	**5**	**2**	**IV**		2	
Planariidae	*Polycelis felina*	**5**	**3**	**II**	**C**		95
Snails							
Lymnaeidae	*Radix balthica*	**3**	**1**	**IV**	**D**	120	
Valvatidae	*Valvata cristata*	**3**	**2**	**IV**	**C**	7	
Limpets and mussels							
Sphaeriidae	*Pisidium sp.*	**3**			**D**	28	4
Oligochaeta		**1**			**D**	16	60
Leeches							
Glossiphoniidae	Glossiphoniidae (juvenile / damaged)	**3**		**IV**	**C**	1	
Glossiphoniidae	*Glossiphonia complanata*	**3**	**1**	**IV**	**C**	2	1
Mites							
Hydracarina		**-**					1
Crustaceans							
Ostracoda		**-**				12	
Gammaridae	*Gammarus pulex*	**6**	**1**	**II**	**B**		750
Crangonyctidae	*Crangonyx pseudogracilis*	**6**	**1**	**III**	**D**	16	
Asellidae	*Asellus aquaticus*	**3**	**1**	**IV**	**D**	68	

True bugs							
Corixidae	*Sigara venusta*	**5**	**4**	**IV**	**C**	1	
Beetles							
Haliplidae	*Haliplus lineaticollis*	**5**	**1**	**III**	**C**	2	
Scirtidae	Scirtidae (larvae / damaged)	**5**		**IV**	**B**		1
Elmidae	*Elmis aena*	**5**	**1**	**II**	**B**	1	
Alderflies							
Sialidae	*Sialis lutaria*	**4**	**1**	**IV**	**D**	3	
Caddisflies							
Limnephilidae	Limnephilidae (juvenile / damaged)	**7**		**IV**	**B**	3	1
Beraeidae	*Beraeodes minutus*	**10**	**5**	**II**	**B**	1	
Goeridae	*Silo nigricornis*	**10**	**5**	**I**	**A**		1
Sericostomatidae	*Sericostoma personatum*	**10**	**1**	**II**	**B**	1	
Trueflies							
Chironomidae	Orthocladiinae	**2**				104	
Chironomidae	Tanytarsini	**2**					3
Pediciidae	*Dicranota* sp.	**5**		**II**	**B**		8
Limoniidae	*Neolimnomya sp.*	**5**			**B**		1
Psychodidae		**-**			**D**		5
Ptychopteridae	*Ptychoptera sp.*	**-**		**II**	**D**		14
Total number of species						**12**	**4**
Total number of genus/above						**6**	**10**
BMWP score						**75**	**47**
ASPT (BMWP)						**4.7**	**4.7**
PSI Score (species)						**13.6**	**46.7**
PSI Score (family)						**16.7**	**39.1**
LIFE Score (species)						**6.4**	**8.5**
LIFE Score (family)						**6.1**	**7.1**
CCI Score						**8.8**	**12.5**



NOTES / LEGEND

- Proposed route alignment
- Proposed tunnel
- Proposed route alignment 2km buffer
- Macroinvertebrate Samples
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)

Revision Details	By / Check	Date	Suffix

Purpose of issue: FINAL

Client: Highways England

Working on behalf of highways england

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: MACROINVERTEBRATE SURVEYS AMESBURY SPRINGS

Designed	Drawn	Checked	Approved	Date
CC	KD	WW	WW	03/10/18

Internal Project No. 60541439

Scale @ A3: 1:10,000 | Zone: SW

Highways England
Temple Quay House
2 Temple Quay
Bristol
BS1 6PN

AmW
AECOM + mace + WSP

Drawing Number

Highways England PIN	Originator	Volume	Rev
HE551506	AMW	GEN	00
SCHEME WIDE	DR	GI	0343
Location	Type	Role	Number

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